

Conclusion & Further Work

8.1 Introduction

This chapter presents the overall conclusion of the project followed by the achievements of the objectives. This section also discuss about the future work of the system.

8.2 Overall Conclusion of the System

This thesis presents an optical character system for ancient Sri Lankan Brahmi inscriptions that is carved in 3rd Century B.C. Due to the high amount of noise that resides in the inscriptions, developing the OCR (Optical Character Recognition) system for Brahmi characters in ancient Sri Lankan inscriptions has been a challenging task with compared to the other developed optical character systems.

The neural network technology was used to recognize the characters of the inscriptions and the output given by the neural network was rectified using a post processing module for accurate results. The post processing module was build up with a multi agent system that consists of a Lexical, Structure Analyst and Semantic agents. These agents communicate and negotiate with each other and provide the final output of the system.

The overall system was tested with 12 inscriptions that were found in archaeological sites such as Wessagiriya , Handagala Vihara etc. We have obtained 84% complete recognition rate and 8% of partial recognition rate for the selected 12 inscriptions. We have achieved good results even with high amount of noise in these inscriptions.

8.3 Objective Achievements

The objective to critically study about the techniques that could be used to recognize the characters were performed thorough literature survey that was conducted to find out the technologies that have been used in optical character recognition system. Base on conducted literature survey we postulated, the neural network technology together with the multi agent technology could be used to recognize the characters successfully for certain extend. A Study on Neural Network technology in character recognition

process and Multi – Agent Systems in problem solving context is performed. This provide the evidence for the achievement of the objectives - study how the Neural Network technology that could be used in character recognition process and study how the Multi – Agent Systems are used in problem solving.

Also a comprehensive study was performed on Brahmi characters by using the materials that are related to the history of Sri Lanka. In addition stone inscriptions in the particular era were explored for later processing.

The objective to design and develop the prototype of optical character recognition system that is used to recognize the characters in the ancient Sri Lankan inscriptions is achieved by designing and developing a system using the technologies - Neural Network and Multi Agent Systems. The neural network is designed as a multi layer perceptron model with the relevant parameters that were obtained by trial and error sessions. And the multi agent system was design with several agents, who are acts as experts in different areas such as morphology, sentence structure and semantics of a particular context.

As explained in the evaluation chapter, this system is evaluated the with 12 selected inscriptions in order to full fill the objective - evaluate the prototype developed to recognize the characters in the ancient Sri Lankan slab inscriptions.

8.4 Problems Encountered

A Sinhala character could have lot of variations with the base character. For example the letter ට could have variations such as ට , ට෦ , ට෦෦ , ට෦෦෦ , ට෦෦෦෦ , ට෦෦෦෦෦ , ට෦෦෦෦෦෦ , ට෦෦෦෦෦෦෦ , ට෦෦෦෦෦෦෦෦ etc. Creating representation for all of these letter variations is a difficult task since it could consume character representation with more that 100 characters. This problem is solved by storing only the base character in the database and by finding the relevant variation for the letter through regular expression that was implemented in the code.

Unlike the standard optical character systems it is unable to segment the characters base only on the horizontal and vertical projection graphs due to the high noise availability. Therefore the user has given the facility to select the character boundaries by just ticking off a check box. And the user has also given the control to change locations of these check boxes by changing the threshold values simply by adjusting a slider. It was suggested to automate this manual process as future work.

8.5 Further Work

The next step in the development of this system is to automate the character segmentation process. Currently the horizontal and the vertical threshold that is required for segmentation are manually stated by the human user. As further work it was decided to automate this process where the system itself could calculate the threshold values and perform the segmentation automatically.

8.6 Summary

This chapter presents the overall achievements of the system. Base on the evaluation the system has recorded high inscription recognition percentage. And also has described in this section, the stated objectives of system has successfully achieved.



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